Dental treatment needs in Dutch nursing homes offering integrated dental care

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ABSTRACT

The purpose of this study was to determine the dental treatment needs of the residents in nursing homes (NHs) where integrated dental care has been offered without financial barriers.

The dental status and surgical, prosthetic, restorative, and periodontal treatment needs were determined for 432 residents (average age 78.8 years) in three Dutch NHs. Although the subjects had no complaints, 72% had dental treatment needs. It was determined that treatment was necessary for 64% of the edentulous subjects (N = 316), 100% of the partially dentate subjects (N = 76), and 87% of the fully dentate subjects (N = 40).

We concluded that when residents can no longer carry out oral hygiene independently, it is very difficult for them to maintain a level of oral health where their dental treatment needs have been met, especially for dentate residents.

KEY WORDS: remaining treatment need, nursing home residents

Dental treatment needs in Dutch nursing homes offering integrated dental care

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Introduction

In the late 20th century, the large majority of residents of Dutch nursing homes (NHs) were edentulous. However, due to increased oral health literacy, better oral self-care, a higher level of professional dental care, and effective measures in preventing dental diseases, elderly people entering NHs today are more likely to be dentate. Consequently, more attention is being given to the oral health, oral hygiene care, and dental treatment of the 51,500 residents in the 334 Dutch NHs.[1] Several authors[2-14] have written about how the need for oral care and treatment have increased as rates of edentulism have decreased in elderly NH residents in many western countries. However, little data are available on how oral care, and treatment offered in NHs has affected the dental status of the residents. Also, the organization of oral care and treatment in NH settings varies widely in different countries.[1,3,4,6,8,9,11,12,14-16]

In the Netherlands, the community pays for the cost of a resident's stay in a NH, based on a general law for exceptional health care costs (those costs not covered by "normal" health insurance).[1] Nursing home residency is limited to persons with serious physical or psychological impairments. Residents of NHs generally are not able to carry out oral hygiene independently so the nursing staff must do it for them. The medical and nursing staff usually requests professional dental treatment when it is needed, after consulting with the resident and his or her relatives and legal guardians. Common oral problems include: pain, eating disorders, speech disturbances, or such symptoms as swelling, bleeding, bad breath, or poor esthetics.

However, a few years ago, some NHs began offering integrated dental care for their residents. The goal was to prevent problems with oral health and function, to overcome residual treatment needs of new residents, and to maintain optimal oral health for their residents. This implies that a dentist would examine all the residents and would regularly offer recalls and treatment in the NH facilities. The dental care is offered at no cost to the resident and in collaboration with the nursing and medical staff.

Dentists offering this integrated care must accept that their recommended dental treatment plan may not be accepted, since it may be contraindicated by the resident's medical or psychological condition, or because the resident (or his/her relatives or legal guardian) may refuse the suggested dental treatment plan.[15] Logistical and infrastructural limitations may also prevent the treatment from being carried out.

The decision to carry out a dental treatment is based on the resident's right

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of self-determination, the institution's duty to provide good care and medical help, and the dental team's duty to perform the appropriate treatment that is in the resident's best interest. After deliberation, it is often concluded that the recommended dental treatment plan should not be done, therefore dental treatment needs may persist.

In this study, we present data quantifying dental treatment needs by studying it in three of the first NHs in the Netherlands to offer integrated dental care for their residents.

Materials and methods

The study was carried out in three NHs, widely separated geographically from each other in the Netherlands. Table 1 shows the characteristics of the residents who were included in this study.

Nursing Home A had 175 beds. The average age of the residents was 81.7 years; the youngest was 34.7 and the oldest was 101.4 years of age. The average duration of stay was 28 months. Thirty-six percent of subjects resided in the NH for a somatic problem, versus 63.9% for a psychogeriatric one. The dental treatment room was a fully equipped dental office and the dentist worked 8 hours per week in the NH, averaging 2.3 hours of treatment per year per resident. He examined every new resident within a few days of admittance to the home and reported his findings and proposals for treatment in the resident's care file. Most suggested treatments were for surgical and prosthetic needs. Residents of the NH were invited to attend the dentist for recalls and treatment every 6 months, or when necessary or desired. The nursing staff provided daily oral care. The dentist had worked in the NH for more than two decades and could easily be approached by the staff for consultation, treatment planning, and organization of daily oral care for individual residents. During the period of this study, none of the residents or nursing staff members spontaneously asked for dental treatment or had any complaints about oral health.

Nursing Home B had 180 beds and also mainly housed elderly residents. The average age was 81.4 years; the youngest resident was 39.4 years of age, the oldest 98.8 of age. The average duration of stay was 18 months. The reason for living in the NH was a somatic problem for 63.5% of the residents versus 36.5% due to psychogeriatric deficits. The dentist's treatment facilities were limited, with a dental treatment chair in a corner of a multifunctional medical treatment and consultation room. Dental treatment was confined to consultations, extractions, and minor prosthetic treatment. When more complex treatment was required, it was scheduled in the institution's dentist's private practice near the NH, at no cost to the resident. After an initial examination and treatments upon admittance to the NH, the medical and nursing staff would decide whether to schedule recalls and treatments. The nursing staff offered daily oral hygiene care. For more than 5 years, the dentist had worked 4 hours per week at the NH, averaging 1.1 hours per resident per year. He was well known by the staff, examined all new patients within a week of their being admitted to the NH, and reported his treatment plan in each resident's care file. During the period of this study, none of the residents or members of the nursing staff asked for treatment or had complaints about pain or oral health needs.

Table 1. Characteristics of the subjects and provided care.

Nursing home	A	B	C	Total group
Number of residents	169	159	104	432
Average age (mean and SD in years)	81.7 (10.5)	81.4 (10.7)	69.8 (19.3)	78.8 (14.1)
Age youngest/oldest	34.7–101.4	39.4–98.8	19.4–94.7	19.4–101.4
% somatic/psychogeriatric	36.1/63.9	63.5/36.5	68.3/31.7	53.9/46.1
Average duration (months)	28	18	52	30
Dentist hours per resident/year	2.3	1.1	1.6	1.7
Oral hygienist hours per resident/year	-	-	3.2	0.8

Nursing Home C had 125 beds. At a mean age of 69.8 years, these residents were significantly younger ($p < .001$) than the residents of the other two NHs. The reason for this was that this NH had a large department where many young residents were being rehabilitated after acute trauma (e.g., after traffic accidents). In addition, the NH specialized in caring for residents who had relatively rare neurological diseases, which required daily nursing care, even for the younger residents. The youngest resident was 19.4 years of age, the oldest 94.7 of age. The average duration of stay in the NH was 52 months. The reason for residing in the NH was a somatic problem for 68.3% and for 31.7% it was psychogeriatric. The dentist worked 4 hours per week in a fully equipped dental treatment room and a dental hygienist was appointed for 8 hours per week. Residents received on average 1.6 hours with the dentist and 3.2 hours with the hygienist per year. The treatment facilities were specially adapted for patients with physical impairments. All dentate residents had their own dental treatment file and treatment predominantly consisted of periodontal and restorative treatment. Dentate residents were invited to see the dentist for periodic recall appointments, followed by treatment when necessary or desired, every 6 months. Dentate residents were also offered treatment in the NH by the dental hygienist at individually determined periods varying between 1 and 6 months. The daily hygiene care for some dentate residents was shared with the nursing staff and with the dental hygienist carrying out daily oral hygiene herself twice a week. Treatment of edentulous residents was carried out when suggested by the medical and nursing staff. The dentist and dental hygienist were very well integrated with the medical and nursing staff of the institution for more than 5 years. During the study period, none of the residents or members of the nursing staff asked for treatment or had complaints

Table 2. Dental status in relation to age.

Nursing home	A	B	C	Total group
Number (%) edentulous residents	136 (80%)	124 (78%)	56 (54%)	316 (73%)
Average age of edentulous residents (years)	82.6	82.8	79.2	82.1
Number (%) partly dentate residents	28 (17%)	26 (16%)	22 (21%)	76 (18%)
Average age partly dentate residents (years)	80.1	80.9	72.2	78.1
Number (%) fully dentate residents	5 (3%)	9 (6%)	26 (25%)	40 (9%)
Average age fully dentate residents (years)	65.4	64.9	47.6	53.7

about pain or oral health problems.

For this study, the three dentists of these NHs and one dentist working in an academic center for special dental care examined and evaluated the oral status of the residents. In Home A, 169 of the 175 residents were studied, along with 159 of the 180 total residents in Home B, and 104 of the 125 residents in Home C. Reasons for nonparticipation were absence (24), too ill to be examined by the researchers (3), or refusal to participate in the study (21).

The intraoral examination was only done after obtaining formal written consent from the resident or his/her legal guardian in Home A and C. In Home B, written consent was obtained from the NH medical and managing directors, while residents or their legal guardians orally gave consent after their cooperation was requested. Working in changing teams of two (one of the researchers being the institution's dentist), the four dentists examined the mouth of the 432 participating subjects. Examinations were done under existing natural or artificial light with dental mirrors, without transporting the subject to the dental treatment facility. A research form was completed for every subject, which included demographic data, date and reason for admittance to the NH, dental status, replacement of teeth by partial or complete dentures, denture stability and retention, caries, mobility of teeth, plaque, calculus formation, the intraorally determined dental treatment needs (including surgical, prosthetic, restorative, and periodontal needs), and the health of the intra- and extraoral soft tissues. For this purpose, the four dentists had consensus meetings to plan how the various conditions should be scored and recorded, and when intraoral treatment should be indicated for surgical, prosthetic, restorative, and periodontal needs.

Surgical treatment needs, when scored, nearly always consisted of the need for extraction. Prosthetic treatment needs were indicated when removable prostheses were not present or were deemed to have inadequate function or retention. Restorative treatment needs were indicated when caries or inadequately functioning restorations were found and these were restored with composite restorative materials (Glass ionomers were not used in these three NHs). Periodontal treatment was indicated when there was a need to remove plaque and calculus by scaling and curettage.

Intraorally determined treatment need was recorded when the two investigating dentists agreed that oral treatment could improve the subject's oral health and prognosis, regardless of the subject's (or his/her legal guardian's) wish to have dental treatment, or the medical condition or medication of the subject. It was rare that one of the investigating dentists considered treatment necessary while the other did not, since dental treatment need was only determined intraorally, without taking into account the subject's wishes or general health. In these rare cases of disagreement, no treatment need was recorded.

Dental status was classified as edentulous when no teeth were present in both jaws. Dentate subjects were classified as fully dentate when at least 10 teeth were present in each jaw, so the minimal number of teeth was 20. All configurations with between 1 and 19 teeth present were classified as partly dentate.

The procedures for the intraoral examination and recording in the registration form took an average of 10 minutes per subject.

Statistical analysis

The collected data were analyzed using a standard statistical program (SPSS 15.0, SPSS, Inc., Chicago, IL, USA), and descriptive statistics were used to present characteristics of the subjects and provided/needed care. Chi-square tests were used to test possible differences in dental status and treatment need between the three nursing houses. *p*-values less than .05 were considered significant.

Results

Dental status and age

The large majority of the subjects (73%, 316 persons) were edentulous; 76 subjects (18%) were partly dentate, and 40 (9%) were fully dentate. The average age of the edentulous subjects was 82.1 years; for the partly dentate subjects it was 78.1 years, and for the dentate subjects it was 53.7 years. In Nursing Home C, the number of fully dentate subjects was statistically significantly higher than in the other two NHs ($p < .001$). Table 2 presents the data and percentages for the three NHs.

Edentulous residents, their prosthetic status, and treatment needs

Of the 316 edentulous subjects, 230 (73%) wore dentures in both jaws, 36 (11%) wore a maxillary denture only, and 50 (16%) did not wear dentures at all. Prosthetic treatment need was determined for 201 of the edentulous subjects (64%). Residents in Home A had statistically significantly less treatment needs than the residents in the other two NHs ($p < .001$). The data and percentages are presented in Table 3.

Partly dentate residents, subdivision and treatment needs

Of the 76 partly dentate subjects, 41 (54%) were dentate in the maxillary and mandibular arches, 27 (36%) in the

Table 3. Prosthetic status and treatment needs of the 316 edentulous residents.

Nursing home	A	B	C	Total group
Prosthetic status				
Number of edentulous residents	136	124	56	316
Maxillary and mandibular dentures	108 (80%)	81 (65%)	41 (73%)	230 (73%)
Maxillary dentures only	14 (10%)	15 (12%)	7 (13%)	36 (11%)
No dentures	14 (10%)	28 (23%)	8 (14%)	50 (16%)
Prosthetic treatment need				
Maxillary and mandibular dentures	15 (11%)	67 (54%)	33 (59%)	115 (36%)
Maxillary dentures only	14 (10%)	15 (12%)	7 (13%)	36 (11%)
No dentures	14 (10%)	28 (23%)	8 (14%)	50 (16%)
Treatment needs (overall)				
Treatment need	43 (31%)	110 (89%)	48 (86%)	201 (64%)
No treatment need	93 (69%)	14 (11%)	8 (14%)	115 (36%)

Table 4. Status and treatment needs of the 76 partly dentate residents.

Nursing home	A	B	C	Total group
Status				
Number of partly dentate residents	28	26	22	76
Teeth in maxilla and mandible	15 (54%)	12 (46%)	14 (64%)	41 (54%)
Teeth in mandible only	9 (32%)	11 (42%)	7 (32%)	27 (36%)
Teeth in maxilla only	4 (14%)	3 (12%)	1 (4%)	8 (10%)
Average number of teeth mandible	6.7	4.9	8.1	6.5
Average number of teeth maxilla	3.9	3.0	5.5	4.0
Mandibular (partial) dentures	3 (11%)	1 (4%)	2 (9%)	6 (8%)
Maxillary (partial) dentures	10 (36%)	7 (27%)	8 (36%)	25 (33%)
Specific treatment need				
Surgical, extraction of all teeth	12 (43%)	9 (35%)	5 (23%)	26 (34%)
Surgical, single extractions	10 (36%)	11 (42%)	3 (14%)	24 (32%)
Prosthetic	14 (50%)	22 (85%)	13 (59%)	39 (51%)
Restorative	8 (29%)	12 (46%)	17 (32%)	41 (54%)
Periodontal	13 (46%)	11 (42%)	17 (32%)	41 (54%)
Treatment need (overall)				
Treatment need	28 (100%)	26 (100%)	22 (100%)	76 (100%)
No treatment need	0 (0%)	0 (0%)	0 (0%)	0 (0%)

mandibular arch only, and 8 (10%) in the maxillary arch only. The average number of teeth was 6.5 in the mandible and 4.0 in the maxilla. In the mandible, 6 subjects (8%) wore partial dentures; in the maxilla, 25 subjects (31%) wore partial dentures. All partly dentate subjects were found to have treatment needs (Table 4).

Fully dentate residents, kinds of treatment need

Of the 40 fully dentate subjects, 3 (8%) needed single extractions, 3 (8%) needed prosthetic treatment, 20 (50%) needed restorative treatment, and 30 (75%) needed periodontal treatment. Five dentate subjects (13%) were determined to have no treatment needs (Table 5).

Overall dental treatment needs

A total of 312 subjects (72%) were found to have treatment needs. Residents of Home A had significantly fewer treatment needs than the residents in the two other homes ($p < .001$) (Table 6).

Soft tissue lesions

Of the 316 edentulous subjects, 51 (16%) intraorally were found to have denture-related soft tissue lesions; this related prosthetic treatment need is included in Table 3. Of the 76 partly dentate subjects, 4 (5%) had a caries-related fistula; this surgical treatment need is shown in Table 4. In the 40 fully dentate subjects, no soft tissue pathology was found.

Extraorally, angular cheilitis was found in 43 subjects, 10% of the total 432 subjects studied. Dental treatment need for these subjects consisted of correction of vertical and lip support and is reported under prosthetic treatment need in Table 3 to 5.

The data and percentages for the three NHs and for the studied groups are presented in Table 7.

Discussion

While none of the residents themselves and no members of the nursing or medical staff complained about the residents' oral health, oral treatment needs were found for 72% of the subjects, even though dental treatment in these NHs is offered free of cost for residents and all dentists were easy to approach for treatment. Other studies[15-17] have reported that dentists often consider dental treatment necessary while NH residents themselves consider the suggested treatment unnecessary; our findings agree with these studies. However, the dental treatment needs varied widely in each NH: Home A had 44% of the residents needing care, versus 91% and 90% in

Table 5. Specific treatment needs of the 40 fully dentate residents.

Nursing home	A	B	C	Total group
Specific treatment need				
Number of dentate residents	5	9	26	40
Surgical, single extractions	1 (20%)	2 (22%)	1 (4%)	4 (10%)
Prosthetic	1 (20%)	0 (0%)	3 (12%)	4 (10%)
Restorative	2 (40%)	6 (67%)	13 (50%)	21 (53%)
Periodontal	2 (40%)	7 (78%)	22 (85%)	29 (73%)
Treatment need (overall)				
Treatment need	3 (60%)	8 (89%)	24 (92%)	35 (87%)
No treatment need	2 (40%)	1 (11%)	2 (8%)	5 (13%)

Table 6. Overall treatment need.

Nursing home	A	B	C	Total group
Number of residents	169	159	104	432
Treatment need	74 (44%)	144 (91%)	94 (90%)	312 (72%)
No treatment need	95 (56%)	15 (9%)	10 (10%)	120 (28%)

Table 7. Soft tissue lesions.

Nursing home	A	B	C	Total group
Number of edentulous residents	136	124	56	316
Denture-related lesions	14 (10%)	28 (23%)	9 (16%)	51 (16%)
Number of partly dentate residents	28	26	22	76
Tooth decay-related fistulae	1 (4%)	2 (8%)	1 (5%)	4 (5%)
Number of fully dentate residents	5	9	26	40
Soft tissue lesions	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Number of residents (all)	169	159	104	432
Cheilitis angularis	20 (12%)	16 (10%)	7 (7%)	43 (10%)

homes B and C. This difference can be explained by:

The dentist's number of working hours per resident per year, being the highest in Home A (2.3 hours), versus the lowest in Home B (1.1 hours).

The institution dentist's attitude toward prosthetic dentistry for elderly edentulous residents. The relatively low score in treatment need in Home A was due to the willingness and capability of the institution's dentist to make dentures for the edentulous residents, so that most edentulous residents were wearing well-fitting and occluding maxillary and mandibular dentures. In his limited time, the dentist in Home B did less prosthetic work. The dentist in Home C focused on the dentate residents and also did not spend much time on the edentulous residents.

The proportion of partly and fully dentate residents. All 76 partly dentate residents and 87% of the 40 fully dentate residents still required dental treatment. In the partly dentate residents, based on the intraoral examination, 26 residents needed extraction of all their teeth and construction of complete dentures, while 24 residents required single extractions. Reasons for not carrying out treatment were most often that it was denied by the resident or his/her legal guardian, or it was due to the resident's medical or psychological condition. It also was due to the attitudes and opinions of the institution's medical and nursing staff, and the limited period of time that a new resident was staying in the NH. Often it is decided that dental treatment had no priority, due to the poor health of a new resident.

For the fully dentate residents, surgical and prosthetic treatment was less often indicated. However, the majority of the partly and fully dentate residents required care, especially periodontal treatment. In Home C, this need was present even though the dental hygienist spent 3.2 hours per year per resident. Since she as well as the dentist spent most of their efforts on the 46% partly and fully dentate residents (48 persons), this suggests that the absence of independent daily oral care could not be fully compensated, despite the estimated annual 6 hours of treatment and care supplied by the dental hygienist and 3 hours by the dentist. The loss of independent daily oral care seems to make preservation of the natural dentition very difficult. Thus, a high proportion of partly and fully dentate residents had significant dental treatment needs. The findings suggest that for partly and fully dentate residents, even more care by the hygienist is necessary for prevention and that the 6 hours per year per resident spent in Home C, and the daily oral hygiene care provided by the nursing staff is not enough to preserve the natural dentition.

The duration of the stay in the NH. New elderly residents often have extensive treatment needs when they enter the NH, and due to their health may have potentially shorter durations of residence and a higher dental treatment need. On the other hand, new younger residents (e.g., victims of traffic accidents) will often be dentate without extensive dental treatment needs when they enter the NH but probably will develop needs during their stay because they may have lost their ability for independent daily oral care. This latter group is a small proportion of the population we studied.

The ratio of somatic/psychogeriatric problems of residents. Residents with

psychogeriatric problems on average were older, stayed longer, and were more likely to be edentulous. So, prosthetic rehabilitation, as was done in Home A (with 63.9% residents with psychogeriatric problems), could reduce the dental treatment needs significantly.

Residents with somatic problems were on average younger, stayed a shorter time, and were more likely to be dentate or partly dentate. A high proportion of residents with somatic problems had higher dental treatment needs, since for partly dentate and fully dentate residents, recommended dental treatment often was denied due to their medical condition, the resident's wishes, and their shorter duration of stay. Also, younger dentate residents without the ability for independent oral care are prone to develop dental treatment needs.

Intraorally, soft tissue lesions were mostly found in edentulous subjects who wore dentures. The prosthetic treatment carried out in Home A led to more residents wearing maxillary and mandibular dentures, and also to fewer soft tissue lesions caused by ill-fitting dentures, especially compared to Home B.

The four fistulae found in the 76 partly dentate subjects were related to caries and did not result in complaints by the four residents. Extractions or endodontic treatments were indicated. However, the health and the preferences of the resident had to be considered. Although the rates of recommended surgical, restorative, and periodontal treatment were high, we did not see abscesses and other consequences of the unhealthy restorative, periodontal, and endodontal (and periapical) conditions. Possibly this was a result of the provided treatments and care in these NHs.

Of the 40 fully dentate subjects, 3 needed single extractions, 21 needed restorative treatment, and 29 needed periodontal treatment, but no soft tissue lesions were found. Possibly, the provided surgical, restorative, periodontal, and daily oral hygienic care prevented soft tissue pathology.

Extraorally, angular cheilitis was found in 10% of all subjects studied. The lowest rate was found in Home C. Possibly, this finding relates to the younger average age of the residents and the lowest rate of edentulousness. Angular cheilitis is related to reduced vertical and horizontal lip support combined with weakened general health and reduced resistance to infection by microorganisms.[18] The conditions required to develop this lesion were more likely to exist in Home A and B, with findings of 10% and 12%, respectively, in that population, compared to 7% in Home C. Considering the higher proportion of edentulous subjects wearing maxillary and mandibular dentures in Home A, the findings for Home A and B were interesting. Possibly, the high proportion of residents with psychogeriatric problems in Home A influenced this situation. However, our sample of subjects had a much lower rate than the 28% found by Peltola *et al.*[9] in a population of 260 hospitalized elderly in Finland.

The intraoral examinations were conducted by two dentists, one of whom was the institution dentist. We chose this procedure so we could guarantee that when oral health problems were noticed during the examinations, treatment could be offered quickly and easily, when necessary and possible. The authors were conscious of the fact that, from a scientific point of view, this procedure could introduce bias in the evaluation of dental treatment needs. However, we believed that examination by two unprejudiced dentists, unknown to the institution, would not have served the interests of the residents; also, obtaining consent of the residents and institutions would likely have been more complicated. Additionally, we did not want the examination and documentation of the oral health data to be too time consuming or stressful for the frail residents, therefore complete periodontal charting and radiographic evaluation were not done.

Further studies should be conducted to determine the dental treatment need in NHs with integrated dental care by comparing them to NHs where residents are not regularly examined by a dentist and where dental treatment is sought only when requested by the nursing and medical staff. Also, the appreciation of the nursing staff for the provided dental treatment and their valuation of the oral condition should be studied. Finally, the effects of the provided integrated care should be studied by comparing the status of new residents with that of longer staying residents. These studies are in progress.

Conclusion

Integrated dental care, as offered to the 432 residents in the three studied NHs, resulted in an oral condition in which no residents or staff members complained about oral health or asked for dental treatment. However, according to the institution's dentists, 72% of the residents still needed dental treatment despite the average 1.7 hours of professional dental care offered annually per resident. Apparently, it is difficult for NH residents to maintain adequate oral health when they are no longer able to carry out daily oral hygiene independently.

This study showed that a high rate of residents (up to 56%) without dental treatment needs can be achieved by replacing the dentures of elderly edentulous residents. For fully dentate residents and especially for partly dentate residents, achieving adequate oral health requires much effort and time. In one of the studied NHs, the dentist and the hygienist spent nearly all their time (3 hours for the dentist and 6 hours for the hygienist per resident per year) on restorative and periodontal treatment for the 48 partly and fully dentate residents. This resulted in only two subjects (4%) requiring no further dental treatment. We assume if these treatment and care were not offered, a more unfavorable situation, possibly with residents and staff complaining, could have occurred. On the other hand, we conclude that for partly and fully dentate residents of NHs, the annual per resident average of 3 hours of oral care with the dentist and 6 hours with the hygienist (in addition to the oral hygiene care provided by the nursing staff) seems insufficient to maintain adequate oral health. In this study, the most favorable rates of adequate oral

health were found to be 69% among edentulous residents, 0% for partly dentate residents, and 40% for the few fully dentate residents.

The increasing number and percentage of partly and fully dentate new residents in Dutch NHs will therefore create an enormous increase in the need for dental treatment and oral hygiene care, as long as the goal remains achieving oral health without the need for dental treatment, when desired by the residents themselves and not prohibited by their medical and mental condition.

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References

1. Dekker J den. *Sociale Tandheelkunde*. Houten: Bohn Stafleu van Lochem, 2004:91-5.
2. Chalmers JM, Pearson A. A systematic review of oral health assessment by nurses and carers for residents with dementia in residential care facilities. *Spec Care Dentist* 2005;25:227-33.
3. Dye BA, Fisher MA, Yellowitz YA, Fryar CD, Vargas CM. Receipt of dental care, dental status and workforce in U.S. nursing homes: 1997 National Nursing Home Survey. *Spec Care Dentist* 2007;27:177-86.
4. Hawkins RJ, Main PA, Locker D. Oral health status and treatment needs of Canadian adults aged 85 years and over. *Spec Care Dentist* 1998;18:164-9.
5. Mojon P, Thomason JM, Walls AW. The impact of falling rates of edentulism. *Int J Prosthodon* 2004;17:434-40.
6. Murray PE, Ede-Nichols D, Garcia-Godoy F. Oral health in Florida nursing homes. *Int J Dent Hyg* 2006;4:198-203.
7. Österberg T, Carlsson GE. Dental state, prosthodontic treatment and chewing ability–a study of five cohorts of 70-year-old subjects. *J Oral Rehabil* 2007;34:553-9.
8. Paley GA, Slack-Smith L, O'Grady M. Oral health care issues in aged care facilities in Western Australia: resident and caregiver views. *Gerodontology* 2009;26:97-104.
9. Peltola P, Vehkalahti MM, Wuolijoki-Saaristo K. Oral health and treatment needs of the long-term hospitalised elderly. *Gerodontology* 2004;21:93-9.
10. Reed R, Broder HL, Jenkins G, Spivack E, Janal MN. Oral health promotion among older persons and their care providers in a nursing home facility. *Gerodontology* 2006;23:73-8.
11. de Mello AL, Padilha DM. Oral health care in private and small long-term care facilities: a qualitative study. *Gerodontology* 2009;26:53-7.
12. Söderpalm Andersen E, Söderfeldt B, Kronström M. Oral health and treatment need among older individuals living in nursing homes in Skaraborg, V‰stra Götaland, Sweden. *Swed Dent J* 2006;30:109-15.
13. Stoller EP, Pyle MA, Perzynski AT. Priorities for oral health goals in a sample of older adults. *Spec Care Dentist* 2004;24:220-8.
14. Unlüer S, Gökalp S, Doğan BG. Oral health status of the elderly in a residential home in Turkey. *Gerodontology* 2007;24:22-9.
15. Ettinger RL, Beck JD, Miller JA, Jakobsen J. Dental service use by older people living in long-term care facilities. *Spec Care Dentist* 1988;8:178-83.
16. Vigild M. Denture status and need for prosthodontic treatment among institutionalized elderly in Denmark. *Community Dent Oral Epidemiol* 1987;15:128-33.
17. Mojon P, MacEntee MI. Estimates of time and propensity for dental treatment among institutionalised elders. *Gerodontology* 1994;11:99-107.
18. Waal I van der. Het mondslijmvlies. In: *Geriatrische Tandheelkunde*. Houten: Bohn Stafleu van Lochem; 1999;91-102.